SeaDAC Lite User Manual

SEALEVEL
SYSTEMS INCORPORATED

www.sealevel.com PO Box 830 – Liberty, SC 29657 864.843.4343

Table of Contents

INTRODUCTION **1**

BEFORE YOU GET STARTED **4**

WHAT'S INCLUDED 4
OPTIONAL ITEMS 4

HARDWARE DESCRIPTION **5**

SEADAC LITE CONFIGURATIONS & SPECIFICATIONS 5
8111 – 4 Optically Isolated Inputs/4 Reed Relay Outputs *5*
8112 – 4 Optically Isolated Inputs/4 Form C Outputs *6*
8113 – 4 Optically Isolated Inputs *7*
8114 – 4 Reed Relay Outputs *8*
8115 – 4 Form C Relay Outputs *9*
8126 – 32 Channel TTL *10*
SEADAC LITE POWER REQUIREMENTS 13

SEALATCH™ USB **14**

SEALATCH LOCKING USB CABLES 15

SEAMAX APPLICATION SUITE **16**

SEAMAX OVERVIEW 16
COMMUNICATING VIA MODBUS 17
SEAMAX SOFTWARE INSTALLATION 18
MAXSSD CONFIGURATION & DIAGNOSTICS UTILITY 19
TROUBLESHOOTING SEAMAX 30

WIRING OPTIONS **32**

I/O WIRING – SEADAC LITE 8111 - 8115 MODULES 32
I/O WIRING – SEADAC LITE 8126 TTL MODULE 33

TECHNICAL SPECIFICATIONS **35**

APPENDIX A – HOW TO GET ASSISTANCE **36**

APPENDIX B – CAD DRAWINGS **37**

APPENDIX C – COMPLIANCE NOTICES **38**

FEDERAL COMMUNICATIONS COMMISSION STATEMENT 38

WARRANTY **39**

Introduction

SeaDAC Lite™ USB digital I/O modules provide a low I/O count solution in a small, rugged enclosure. Models are available with optically isolated inputs, Reed or Form C relay and TTL outputs. SeaDAC Lite modules are powered by the USB port, eliminating external power supplies.

SeaDAC Lite modules integrate a SeaLATCH™ USB port that provides a secure metal-to-metal connection and prevents accidental cable disconnection. SeaLATCH connectors are fully compatible with standard USB cables.

For easy software integration, application programs or 3rd party software can use Sealevel's SeaMAX library that includes a variety of helpful diagnostic utilities and sample programs. SeaDAC Lite modules are supported under Windows 2000, XP and Vista™ operating systems.

For embedded system solutions, SeaDAC Lite modules are available in iPorthole™ versions with the "Intelligent Porthole" family of USB digital I/O products. Simply design the 3.2" x 3.1" Porthole mounting footprint into your enclosure to mix and match iPorthole USB I/O modules for maximum configurability. The Porthole footprint offers a standard method for interfacing real-world I/O connections.

SeaDAC Lite modules are USB 1.1 compliant, USB 2.0 compatible, and are powered by the USB port, eliminating external power supplies. OEM versions without enclosures or Porthole mounting plates are also available.

This manual covers the installation & operation of these SeaDAC Lite modules:

SeaDAC Lite DIO-8	**4 Isolated Inputs / 4 Reed Relay Outputs**	
	SeaDAC Lite Module	P/N 8111
	iPorthole Module	P/N 8111-KT
	OEM Module	P/N 8111-OEM
SeaDAC Lite PLC-8	**4 Isolated Inputs / 4 Form C Relay Outputs**	
	SeaDAC Lite Module	P/N 8112
	iPorthole Module	P/N 8112-KT
	OEM Module	P/N 8112-OEM
SeaDAC Lite ISO-4	**4 Optically Isolated Inputs**	
	SeaDAC Lite Module	P/N 8113
	iPorthole Module	P/N 8113-KT
	OEM Module	P/N 8113-OEM
SeaDAC Lite REL-4	**4 Reed Relay Outputs**	
	SeaDAC Lite Module	P/N 8114
	iPorthole Module	P/N 8114-KT
	OEM Module	P/N 8114-OEM
SeaDAC Lite REL-4C	**4 Form C Relay Outputs**	
	SeaDAC Lite Module	P/N 8115
	iPorthole Module	P/N 8115-KT
	OEM Module	P/N 8115-OEM
SeaDAC Lite PIO-32	**32 Channel TTL**	
	SeaDAC Lite Module	P/N 8126
	iPorthole Module	P/N 8126-KT
	OEM Module	P/N 8126-OEM

Overview

Sealevel SeaDAC Lite modules are available in various I/O configurations, each designed for maximum flexibility and easy field wiring. SeaDAC Lite modules offer system designers a compact, low-cost alternative for interfacing any USB equipped computer with real world signals. SeaDAC Lite modules are designed to work with third party applications via the Sealevel SeaMAX API. For maximum reliability, all SeaDAC Lite modules include Sealevel's innovative SeaLATCH locking USB connector design that prevents accidental cable disconnection.

Industry Segments

SeaDAC modules are perfect for a wide variety of applications and environments including:

- Process Control
- Data Acquisition
- Broadcast Automation
- Security
- Facility Management

Features

- Models Offering Choice of:
  - Optically Isolated Inputs
  - Reed Relay Outputs
  - Form C Relay Outputs
  - TTL Interface
- SeaLATCH Locking USB Connector Prevents Cable Disconnection
- Powered by USB Connection
- Status Indicator LEDs for I/O Activity and USB Connection
- Field Removable Terminal Block Connectors
- Optional Spring-Clamp Terminal Blocks Available
- Industry standard 50-pin relay rack connector
- Wide Operating Temperature (0°C to +70°C)
- Extended Temperature Available (-40°C to +85°C)
- Housed in Rugged, Attractive Plastic Enclosure
- Compact Size with Versatile Mounting Capabilities
- Available in iPorthole and OEM versions

Before You Get Started

What's Included

All SeaDAC modules are shipped with the following items. If any of these items is missing or damaged please contact Sealevel for a replacement.

- SeaDAC Lite Digital Interface Adapter
- Item# CA356 – USB Type A to SeaLATCH Type B Cable, 6' in Length
- Sealevel Software CD – SeaMAX Software and Documentation

NOTE: SeaDAC Lite iPorthole and OEM modules do not include an internal USB cable. Order the appropriate internal cable for your system, or use Molex connector p/n# 35507-0400 or equivalent.

Optional Items

Depending upon your application, you are likely to find one or more of the following items useful for interfacing SeaDAC Lite modules.

All items can be purchased from our website (http://www.sealevel.com) or by calling 864-843-4343. For applicable accessories, pin out diagrams are located on the website.

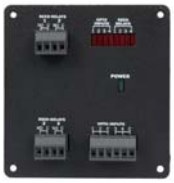
- **CA332 –** SeaLATCH Type A to SeaLATCH Type B device cable, 6' in length
- **CA179 –** USB A to B device cable, 6' in length
- **CA214 –** USB A to A extension cable, 3 meters
- **CA260 –** 2mm Molex to 1x4 0.1" (2.54mm) box header cable, 14" in length. Used to connect iPorthole and OEM modules to the internal USB header found on many popular system motherboards.
- **CA382 –** 2mm Molex to 2mm Molex cable, 14" in length. Used to connect iPorthole and OEM modules to the internal USB header on Sealevel embedded USB hubs and computers.
- **CA383 –** 2mm Molex to 1x4 2mm box header cable, 14" in length. Used to connect iPorthole and OEM modules to the internal USB header found on many popular system motherboards.
- **HUB7i –** Sealevel's powered 7-port USB hub providing up to 5500 VAC of optical isolation to the host system.
- **HUB4 –** High Speed USB 2.0 4-Port Hub – AC powered 4-port USB hub, AC adapter, and USB cable.
- **HUB7 –** High Speed USB 2.0 7-Port Hub – AC powered 7-port USB hub, AC adapter, and USB cable.

Hardware Description

SeaDAC Lite Configurations & Specifications

8111 – 4 Optically Isolated Inputs/4 Reed Relay Outputs

SeaDAC Lite 8111 modules provide 4 optically isolated inputs and 4 Reed relay outputs. Inputs can range from 5-30VDC, while the Reed relays provide long life switch closures that are well suited for low current applications. Each Reed relay has a discrete common and each pair of inputs share a common. Status LEDs display I/O activity and field wiring is simplified via removable 3.5mm terminal blocks.



8111-KT iPorthole

8111-OEM

Inputs

Type:	4 non-polarized optically isolated inputs
Voltage Range:	5-30VDC
Isolation:	300V
Input Resistance:	6.2K Ohms in series
Response Time:	4µs

Outputs

Type:	4 SPST Form A Reed relays
Power:	10VA max.
Contact Voltage:	60VDC max.
Contact Current:	500mA max.
Operate Time:	0.5ms max.
Bounce Time:	0.5ms max.
Release Time:	0.2ms max.

8112 – 4 Optically Isolated Inputs/4 Form C Outputs

The SeaDAC Lite 8112 provides 4 optically isolated inputs and 4 SPDT Form C relay outputs. Inputs can range from 5-30VDC and provide 300V isolation to ground, while the Form C relays switch up to 60VDC @ 5A or 250VAC @ 6A. Each Form C relay has a discrete common and includes normally-open and normally-closed contact connections. Each pair of inputs shares a common. Status LEDs display I/O activity and field wiring is simplified via 3.5mm field removable terminal blocks.

8112-KT iPorthole

8112-OEM

Inputs

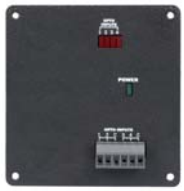
Type:	4 non-polarized optically isolated inputs
Voltage Range:	5-30VDC
Isolation:	300V
Input Resistance:	6.2K Ohms in series
Response Time:	4µs

Outputs

Type:	4 SPDT Form C relays
Power:	DC 240W / AC 1200 VA
Contact Voltage:	60VDC / 250VAC max. (5VDC min.)
Contact Current (DC):	<30 VDC @ 5A max. >30 VDC @ 700mA max. (100mA min.)
Contact Current (AC):	6A max.
Operate Time:	10ms max.
Release Time:	5ms max.

8113 – 4 Optically Isolated Inputs

SeaDAC Lite 8113 modules provide 4 optically isolated inputs with 300V external isolation and high channel-to-channel isolation. Ideal for low voltage monitoring applications, inputs can range from 5-30VDC. Status LEDs display I/O activity and connection to real world signals is made via 3.5mm field removable screw terminal connectors.



8113-KT iPorthole

8113-OEM

Inputs

Type:	4 non-polarized optically isolated inputs
Voltage Range:	5-30VDC
Isolation:	300V
Input Resistance:	6.2K Ohms in series
Response Time:	4µs

8114 – 4 Reed Relay Outputs

The SeaDAC Lite 8114 provides 4 SPST Form A dry-contact Reed relays. Reed relays offer long life performance, fast response time, and are well suited to low current devices. Each relay output has a discrete common. Status LEDs display I/O activity and field wiring is simplified via field removable 3.5mm screw terminal blocks compatible with 14-22 AWG wiring.

8114-KT iPorthole

8114-OEM

Outputs

Type:	4 SPST Form A Reed relays
Power:	10VA max.
Contact Voltage:	60VDC max.
Contact Current:	500mA max.
Operate Time:	0.5ms max.
Bounce Time:	0.5ms max.
Release Time:	0.2ms max.

8115 – 4 Form C Relay Outputs

Control and monitor a variety of devices with the SeaDAC Lite 8115. The module's 4 channels of highly-reliable SPDT Form C relay outputs are rated for up to 60VDC @ 5A or 250VAC @ 6A. Each Form C relay has a discrete common and includes normally-open and normally-closed contact connections. Status LEDs display I/O activity and field wiring is simplified via 3.5mm field removable terminal blocks.

8115-KT iPorthole

8115-OEM

Outputs

Type:	4 SPDT Form C relays
Power:	DC 240W / AC 1200 VA
Contact Voltage:	60VDC / 250VAC max. (5VDC min.)
Contact Current (DC):	<30 VDC @ 5A max. >30 VDC @ 700mA max. (100mA min.)
Contact Current (AC):	6A max.
Operate Time:	10ms max.
Release Time:	5ms max.

8126 – 32 Channel TTL

The SeaDAC Lite 8126 provides 32 channels of buffered drive digital I/O. The module addresses the 32 channels of I/O as four eight-bit ports, each programmable as input or output. Use a standard 50-pin IDC ribbon cable to connect an industry standard relay rack for PC based control and automation of equipment including sensors, switches, security control systems, and other industrial automation systems. A status LED lights when the 8126 is successfully communicating with a USB port.

8126-KT iPorthole

8126-OEM

Power Requirements

Max Output Power:	+5VDC @ 350mA

Inputs

Logic High:	Min 2VDC
Logic Low:	Max 0.8VDC

Outputs *

Logic High:	Max 0.5VDC @ 64mA
Logic Low:	Min 2VDC @ 32mA

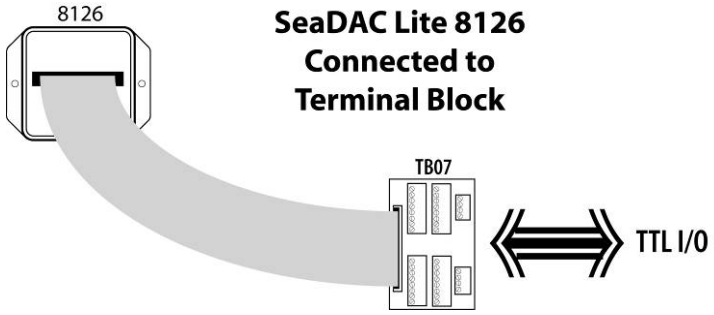
NOTE: The 8126 modules are designed to work with industry standard solid-state relay racks that expect negative logic to operate. The 8126 modules expect positive logic on the inputs. Refer to the I/O Wiring section of this manual for more information.

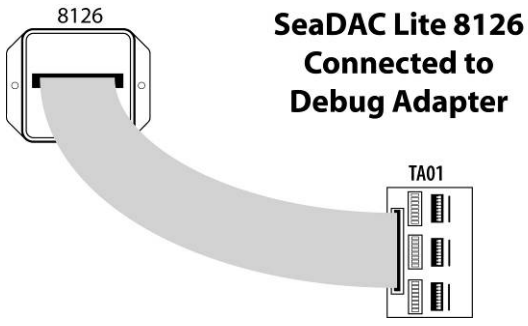
8126 – Optional Items

Depending upon your application, you are likely to find one or more of the following items useful for interfacing the 8126 to real-world signals. All items can be purchased from our website (http://www.sealevel.com) or by calling 864-843-4343.

For TTL applications:

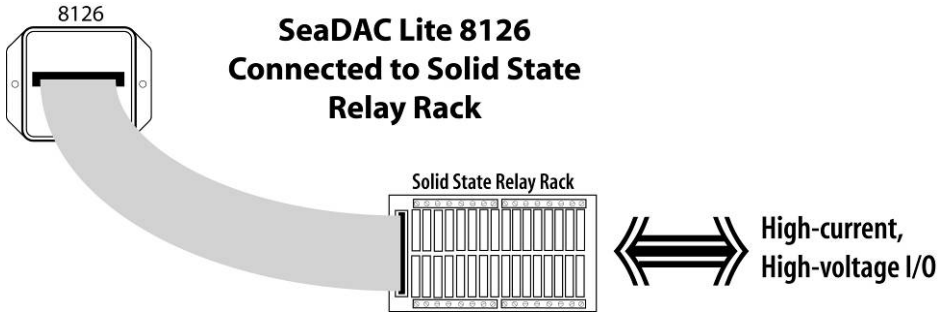
- Terminal Block Kit (Item# **KT107**)
  - Kit includes the TB07 screw terminal block and CA167 ribbon cable for connecting the 8126's 50-pin header connector to your I/O. 6" Snap track and DIN rail clips are included for DIN rail mounting.
- IDC 50 to IDC 50 Pin 40" Ribbon Cable (Item# **CA167**)
  - Interfaces the 8126's 50-pin header connector.
- Simulation/debug module (Item# **TA01**)
  - Module allows monitoring status of output pins and controlling state of input pins. An LED corresponding to each port bit illuminates to indicate state. Eight position DIP-switches are used to generate input status changes.





For high-current, high-voltage applications:

- IDC 50 to IDC 50 Pin Ribbon Cable (Item# **CA167**)
  - 40" cable connects the 8126 to solid-state relay racks equipped with a 50-pin header interface.
- IDC 50 to IDC 50 Pin Ribbon Cable (Item# **CA135**)
  - 40" cable connects the 8126 to solid-state relay racks equipped with a 50-pin edge connector.
- Solid-State Relay Racks:
  - Quad six position relay rack (Item# **PB24HQ**)
    - Relay rack can accept up to six QSSRs for a total of 24 channels. Features a 50-pin header connector for easy interface via 50-conductor ribbon cables.
  - Quad four position relay rack (Item# **PB16HQ**)
    - Relay rack can accept up to four QSSRs for a total of 16 channels. Features a 50-pin header connector for easy interface via 50-conductor ribbon cables.
- Quad Solid-State Relay Modules:
  - AC Input (Item# **IA5Q**) – Provides 4 channels of discrete I/O interface to monitor AC inputs up to 140V @ 10mA.
  - DC Input (Item# **IB5Q**) – Provides 4 channels of discrete I/O interface to monitor DC inputs from 3.3V to 32V.
  - AC Output (Item# **OA5Q**) – Provides 4 channels of discrete I/O interface to control AC outputs up to 140V @ 3A.
  - DC Output (Item# **OB5Q**) – Provides 4 channels of discrete I/O interface to control DC outputs up to 60V @ 3A.
- Simulation/debug module (Item# **TA01**)
  - Module simulates the operation and load characteristics of a standard 24-channel relay rack. An LED corresponding to each port bit illuminates to indicate state. Eight position DIP-switches are used to generate input status changes.



SeaDAC Lite Power Requirements

Sealevel SeaDAC Lite modules are powered by the USB host interface and require 5VDC @ 500mA to be available on the USB port. Most computers and powered USB hubs are capable of meeting this requirement, while passive USB hubs and some laptops running on batteries may not. Check the product manual that shipped with your system or hub if you are uncertain. Sealevel technical support may also be able to help.

The maximum power requirements for each SeaDAC Lite device are shown below.

Item#	Description	mA
8111	4 Isolated Inputs / 4 Reed Relay Outputs	300
8112	4 Isolated Inputs / 4 Form C Relay Outputs	500
8113	4 Optically Isolated Inputs	100
8114	4 Reed Relay Outputs	200
8115	4 Form C Relay Outputs	400
8126	32 TTL Channels	500

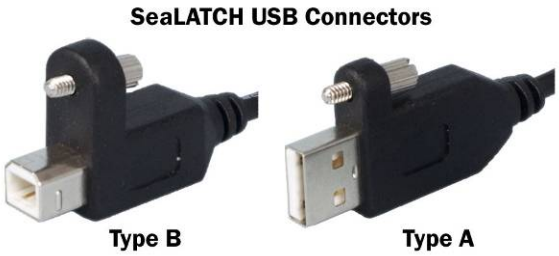
SeaLATCH™ USB

SeaDAC Lite USB digital I/O modules integrate the patent-pending SeaLATCH USB port, which is fully compatible with standard USB cables. When used with the included USB cable (Item# CA356) with a SeaLATCH USB type B connector, the metal thumbscrew provides a secure connection to the device and prevents accidental cable disconnection.

SeaLATCH Locking USB Cables

SeaLATCH USB Connectors

SeaLATCH locking USB cables integrate a small thumbscrew into each USB connector. SeaLATCH USB cables are fully interchangeable with standard USB cables. The thumbscrew provides a secure metal-to-metal connection preventing accidental disconnection. SeaLATCH USB cables are available in three configurations.



Item# CA356

The CA356 is a 72" USB cable with a SeaLATCH type B connector and a standard USB type A connector. This cable provides a secure connection between Sealevel products with a SeaLATCH type B port and legacy USB type A ports. The CA356 is included with Sealevel devices with a SeaLATCH type B port.

Item# CA332

The CA332 is a 72" cable with both SeaLATCH type A and B connectors. This cable secures both ends of the cable to devices with SeaLATCH USB ports and offers complete protection against accidental cable disconnection.

Item# CA355

The CA355 is a 72" cable with a standard USB type B and a SeaLATCH type A connector. This cable provides a secure connection between legacy USB devices and Sealevel products with a SeaLATCH type A port, such as the isolated USB hub (Item# 270U).

SeaMAX Application Suite

SeaMAX Overview

The SeaMAX Suite is a collection of software libraries, and configuration and diagnostic utilities that facilitates rapid application development for SeaI/O, SeaDAC, and SeaDAC Lite modules. The following libraries and utilities are included in the SeaMAX Suite and are covered in this manual:

- MaxSSD Configuration & Diagnostics utility
- Ethernet Config utility
- SeaMAX API

Sealevel digital and analog I/O modules supported by SeaMAX software are designed to work with third party applications via the SeaMAX API. To help simplify application development, the complete API documentation and code samples are automatically installed with the SeaMAX Suite and can be found in Windows by clicking Start → All Programs → Sealevel SeaMAX → Documentation.

Additional SeaMAX documentation is available online that completely details the functions of the SeaMAX API. Example code is included for several popular languages and compilers. The interactive online documentation is located on the Sealevel website at:

http://www.sealevel.com/software/SeaMAX/

Please contact Sealevel technical support with any questions regarding SeaMAX documentation:

Phone: (864) 843-4343

Email: support@sealevel.com.

NOTE:

This chapter covers all SeaMAX supported devices. Not all features are applicable to all devices.

Communicating Via Modbus

Sealevel SeaI/O and SeaDAC modules are designed to integrate seamlessly into existing Modbus networks. The supported command set will vary depending on the SeaI/O model number used. Specialized diagnostic commands and other RTU specific codes are not supported. An overview of the Modbus specification for both RTU and TCP connections is covered in detail in the interactive documentation located on the Sealevel website at:

http://www.sealevel.com/software/SeaMAX/

The official Modbus specification can be found at:

http://www.modbus.org

NOTE:

SeaDAC Lite modules do not currently support Modbus commands.

SeaMAX Software Installation

Proceed with installing the **SeaMAX Software Suite** using the software CD that was included with your Sealevel I/O module. Software drivers are also available on the product webpage on the Sealevel website at www.sealevel.com.

Windows 2000/XP/Vista™ Operating Systems

Do not connect the I/O module to the host until the software is installed.

1. Start Windows.
2. Insert the Sealevel Software CD in to your CD drive.
3. If 'Auto-Start' is enabled the installation window will automatically appear. Otherwise, navigate to the root directory of your CD drive and double-click the 'autorun.exe' application to launch the installation window.
4. Select 'Install Software'.
5. Select the Part Number for your device from the listing.
6. The setup file will automatically detect the operating environment and install the proper components. Follow the information presented on the installation screens that follow.
7. A screen may appear with the declaration: "The publisher cannot be determined due to the problems below: Authenticode signature not found." Please select the 'Yes' button and proceed with the installation. This declaration simply means that the Operating System is not aware of the driver being loaded. It will not cause any harm to your system.
8. During setup, you may specify installation directories and other preferred configurations. This program also adds entries to the system registry that are necessary for specifying the operating parameters for each driver. An uninstall option is included to remove the driver and all registry/INI file entries from your system.
9. Proceed with configuring your Sealevel I/O module using the MaxSSD utility detailed on the following pages.

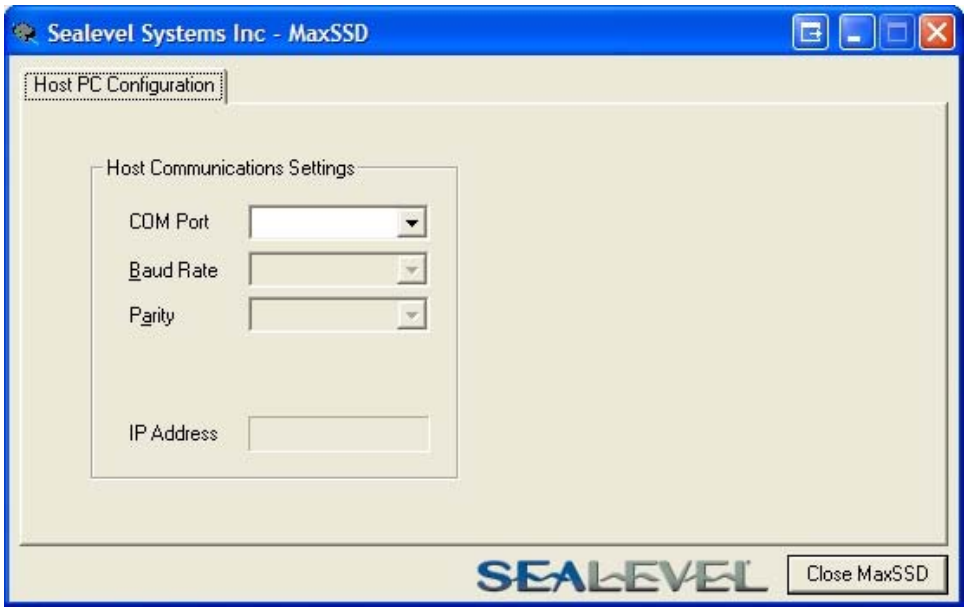
MaxSSD Configuration & Diagnostics Utility

The Sealevel Systems configuration utility, **MaxSSD**, is designed to simplify the installation, configuration, and diagnostics of Sealevel I/O modules. MaxSSD is a Microsoft Windows application and has been tested with Windows 2000, XP, and Vista.

Host PC Configuration Tab

The first time you run the MaxSSD utility (Start → All Programs → Sealevel SeaMAX → MaxSSD) it will default to the "Host PC Configuration" tab. This tab allows the user to choose the initial communication settings for the connected I/O device. The "COM Port" dropdown box allows the selection of a serial COM port (from COM1 to COM256), Ethernet (for Ethernet SeaI/O modules), or SeaDAC Lite (USB).

USB connected SeaI/O and SeaDAC modules are installed as virtual COM ports. Using device manager, expand "Ports (COM & LPT)" by clicking on the '+' next to the category, and locate the COM port for your device and use it in the dropdown box in MaxSSD.

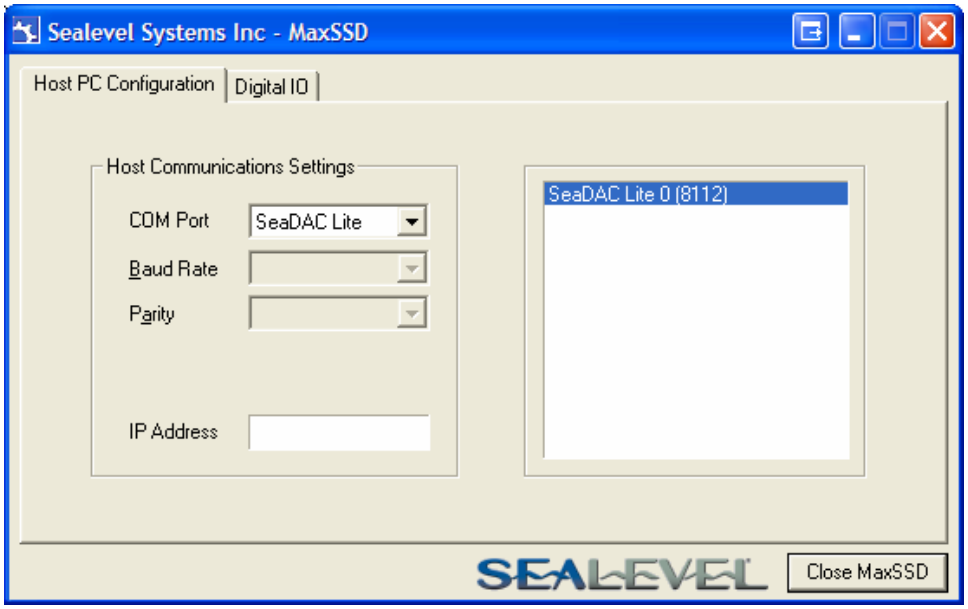


Once a COM port is selected, the baud rate and parity can be selected.

NOTE:	The baud rate and parity of the PC **must** match the settings of the Sealevel I/O module to be configured. The factory default settings for all Sealevel I/O modules are 9600 baud and no parity.

Host PC Configuration Tab (cont.)

To communicate with a SeaDAC Lite module, select "SeaDAC Lite" from the "COM Port" dropdown box. MAXSSD will search for any SeaDAC Lite modules connected to a USB port and display them in a frame (as shown below). A new "Digital I/O" tab will appear. If more than one SeaDAC Lite module is connected, select the one you want to test from the list and click the "Digital I/O tab". You can use this new tab to test the functionality of inputs and relay outputs. The "Digital I/O" tab is covered in detail on subsequent pages.



To communicate with a SeaI/O Ethernet module, select "ETHERNET" from the "COM Port" dropdown box. When Ethernet is selected, MaxSSD searches for any SeaI/O Ethernet modules on the network and displays their IP addresses in the "Available Ethernet Devices" list box (not shown). When an IP address is selected from the list box, a socket is opened to the SeaI/O module and it is ready for communication.

NOTE: If no IP address is shown when using Ethernet modules, review the previous **Hardware Configuration** section, or proceed to the **Troubleshooting** section at the end of this manual.

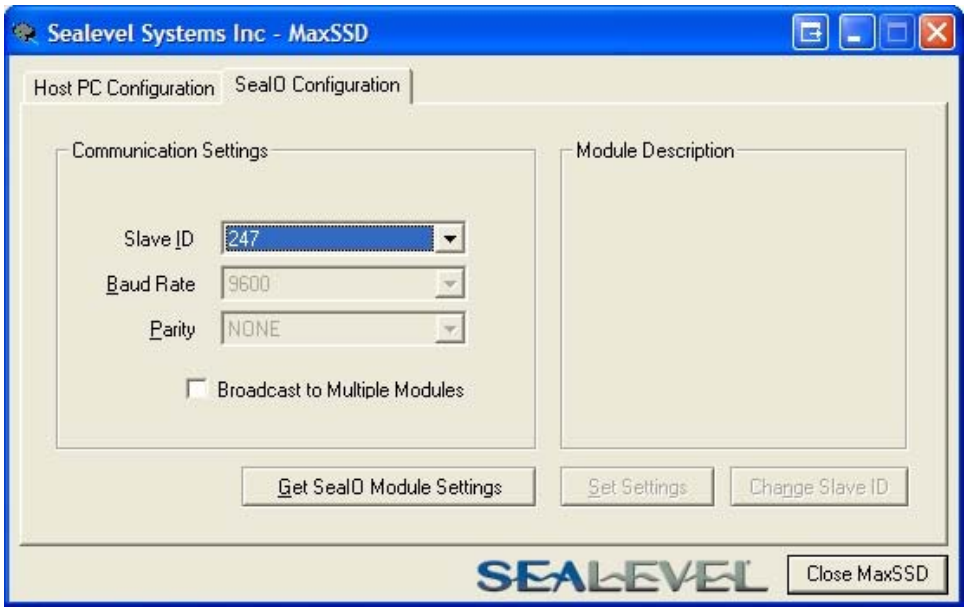
SeaI/O Configuration Tab

Once the host computer is configured correctly, the "SeaI/O Configuration" tab becomes available. This tab only appears for SeaI/O and SeaDAC modules and will not appear when using SeaDAC Lite modules.

Before communicating with a SeaI/O or SeaDAC module, the configuration utility must determine if there is an I/O module at that slave ID address, and if so, what type of module it is. This is the purpose of the **Get** operation.

To perform a **Get** operation, first select the slave ID to which the module is configured. SeaI/O modules are shipped at hardware setting **0** (labeled "ADDR" on the left side of the module) and slave ID **247** by default. All other slave ID addresses (from 1 to 246) are available. However, each daisy chained SeaI/O module must have a unique slave ID address - no duplicates are allowed.

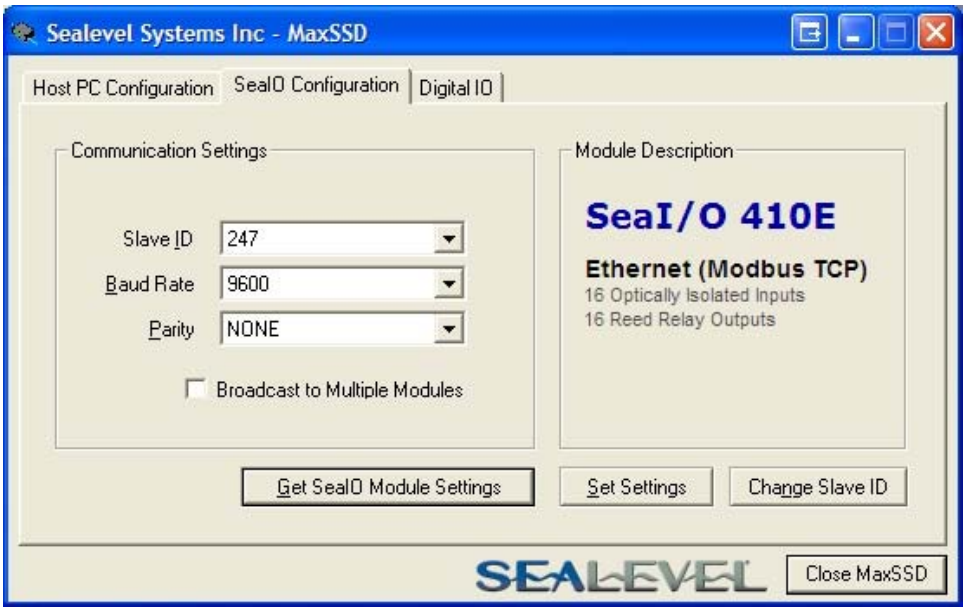
SeaDAC modules are only available on slave ID **247**, and this number cannot be changed. To communicate with a different SeaDAC module, select a different COM port. Use device manager, if necessary, to locate the proper COM port.



Once a slave ID is selected, click the "Get SeaIO Module Settings" button. After a short delay, the information for that I/O module should be displayed. If no information appears, verify the host settings and baud rates are correct and make changes, if necessary. For SeaDAC modules, make sure the baud rate is set to 9600bps. For SeaI/O modules, check the hardware settings (on the left side of the module) and try again.

SeaI/O Configuration Tab (cont.)

After the **Get** command is executed, the "Module Description" frame will display the model type, description, interface, and I/O type. In the example shown, the module found at slave ID 247 is a SeaI/O-410 module with an Ethernet (Modbus TCP) interface. The "Set Settings" and "Change Slave ID" buttons will also be enabled for this module.

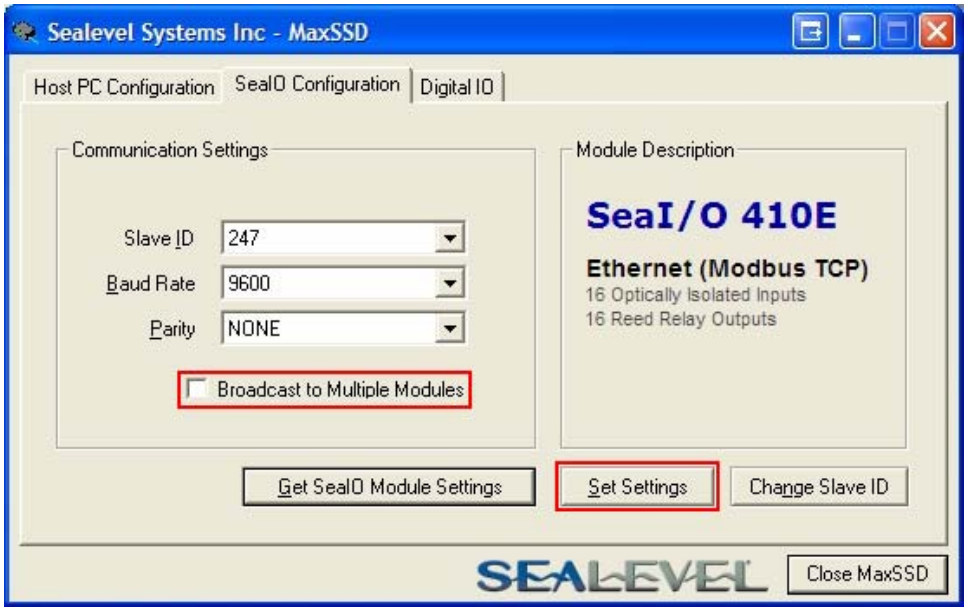


After a successful **Get** operation, additional tabs may be displayed in MaxSSD, depending on the found device model. These tabs display device I/O and allow easy configuration for all SeaMAX supported devices.

SeaI/O Configuration Tab (cont.)

The "Broadcast to Multiple Modules" checkbox, along with the "Set Settings" button can be used to change the baud rate and parity on multiple SeaI/O modules at once. This function only works with SeaI/O modules connected together via the pass-through connectors. This function is disabled with SeaDAC and SeaDAC Lite modules since these devices do not have pass-through connectors.

MaxSSD broadcasts a set data rate and set parity command to all devices on the RS-485 bus, but only those modules listening at the current baud rate will be able to receive and respond. For example, if you have five SeaI/O modules chained together and two are set to 9600 bps and no parity and three are set to 115.2k bps and the PC is set to 9600 bps, only the two modules set to 9600 bps will receive the broadcast set data rate and parity message.



NOTE: **Important note regarding SeaI/O Ethernet (E-series) modules**

The broadcast feature sets the Ethernet SeaI/O (E-series) module's TCP/IP to RS-485 translation data rate independently of the SeaI/O module itself. Therefore, if you have an Ethernet SeaI/O module and you set the data rate to 115.2K bps via a MaxSSD broadcast command, both the RS-485 port and the Ethernet port will respond thereafter to 115.2K bps, as expected. However, if you reset the SeaI/O module by rotating the rotary switch clockwise one complete revolution, the RS-485 port will reset to 9600 bps and no parity, but the Ethernet port will remain unaffected. To restore communications, broadcast another set data rate and parity command (9600 and no parity) via MaxSSD.

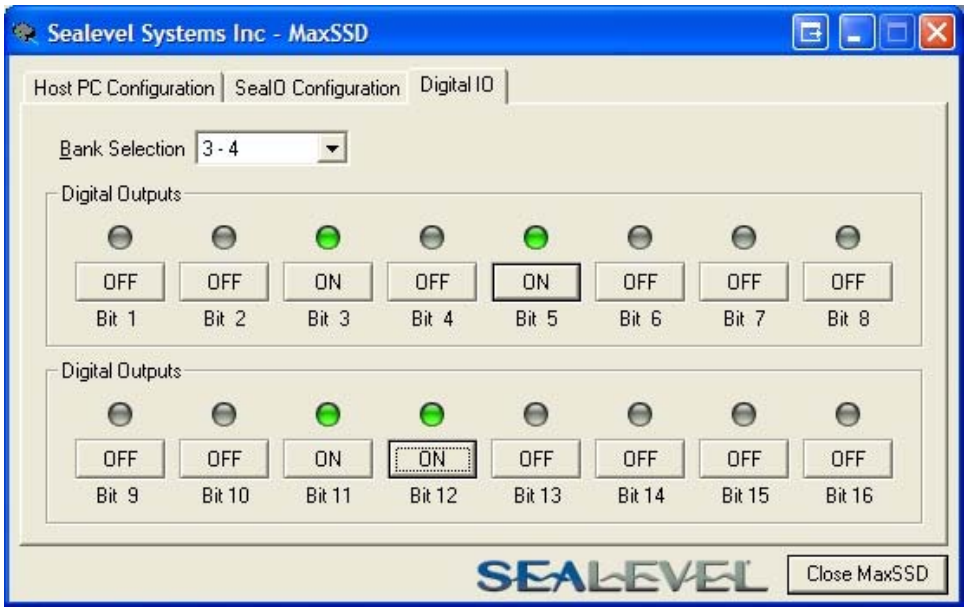
Digital I/O Tab

The “Digital IO” tab of MaxSSD is displayed when using Sealevel I/O devices featuring discrete inputs and outputs. It displays the device’s current input and/or output status in an intuitive and usable manner.

When displaying SeaI/O or SeaDAC modules (excluding SeaDAC Lite), the “Digital IO” tab displays inputs and outputs in groupings (or banks) of eight. Therefore, a Sealevel I/O device with 16 inputs and 8 outputs would show two banks of inputs and one bank of outputs.

When banks of inputs are displayed, the status LEDs update on each of the banks automatically. This allows you to actively monitor external signals.

With a bank of outputs, the output coils can be set using the buttons below each output LED. As each coil is set, the I/O module is read. The corresponding status LED in the “Digital IO” window indicates the state of the coil. In the example below, a SeaI/O module with 16 Reed relays is shown.

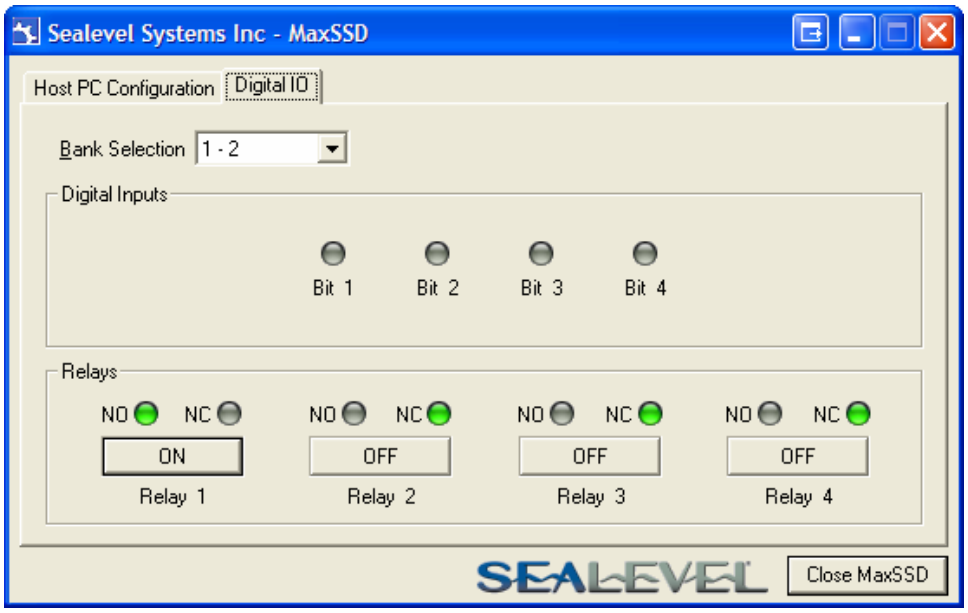


Digital I/O Tab (cont.)

When displaying SeaDAC Lite modules, the "Digital IO" tab displays inputs and outputs in groupings (or banks) of four. Therefore, a SeaDAC Lite module with four inputs and four outputs would show only one bank of inputs and one bank of outputs.

When banks of inputs are displayed, the status LEDs update on each of the banks automatically. This allows you to actively monitor external signals.

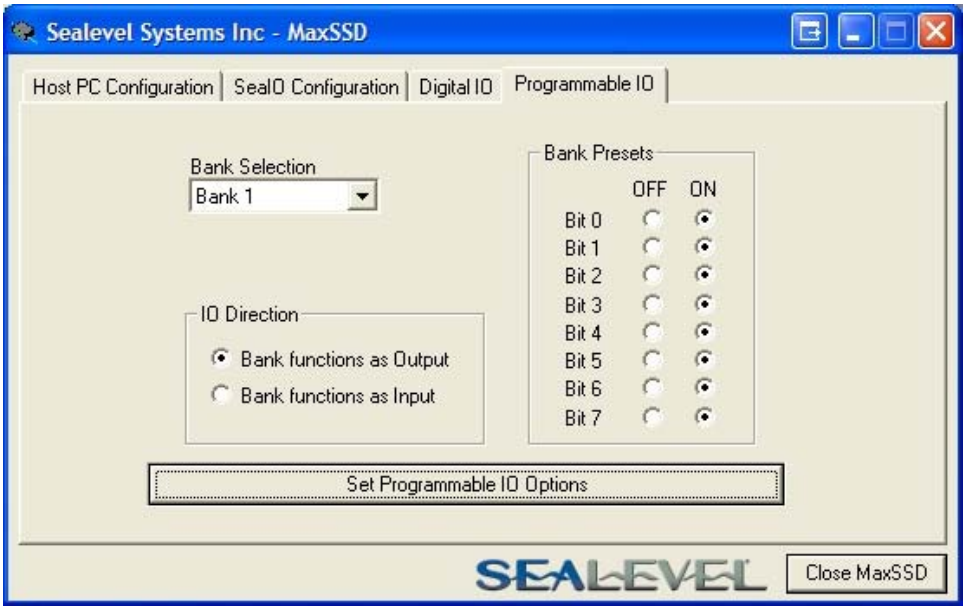
With a bank of outputs, the output coils can be set using the buttons below each output LED. As each coil is set, the SeaDAC Lite module is read. The corresponding status LED in the "Digital IO" window indicates the state of the coil. In the example below, a SeaDAC Lite module with four inputs and four Form C relays is shown, with the state of the relays showing either normally-open (NO) or normally-closed (NC).



NOTE: The "SeaIO Configuration" tab does not appear in MaxSSD when using SeaDAC Lite modules since they have no configurable communication settings.

Programmable I/O Tab

The “Programmable IO” tab of MaxSSD is displayed when using Sealevel I/O devices featuring programmable inputs or outputs. This tab allows for bank configuration, input/output configuration, as well as bit-level presets.



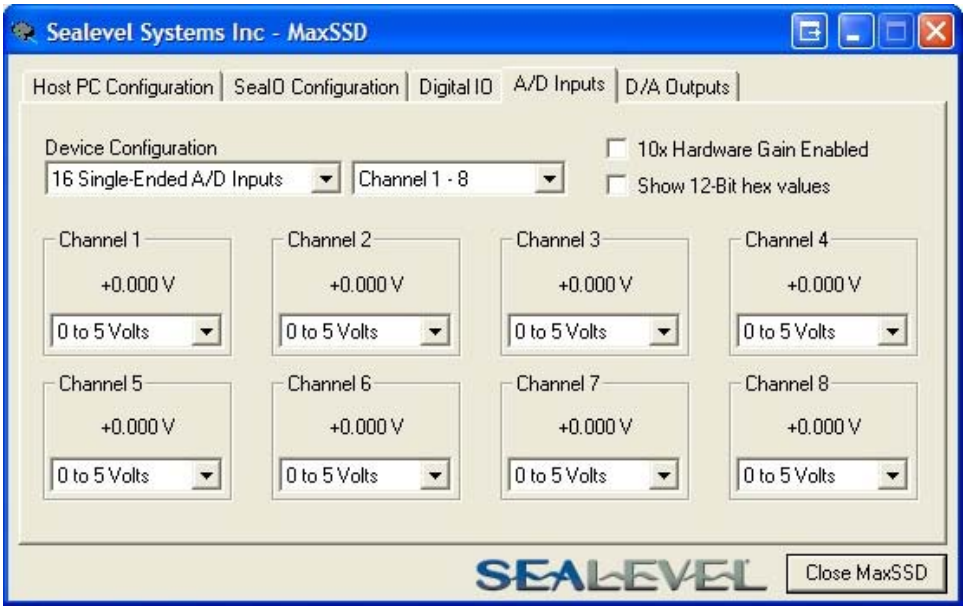
Each bank of programmable I/O can be set as either an 8-bit group of inputs or outputs. By selecting “Bank 1” from the drop-box, clicking the “Bank functions as Input” radio button, and then clicking the “Set Programmable IO Options” button, the first 8 PIO bits on the device will now function as inputs. For ease of configuration, an “All Banks of IO” option is available to configure all of the I/O at one time.

Inputs have no preset mode; therefore, the preset options are disabled for any bank of inputs. Outputs; however, have bit-addressable presets. These presets are used whenever the device is powered up or the bank direction changes from input to output.

NOTE: The output presets, will not lock the outputs into a specified on or off state. They only set the state of the outputs on a power on or bank direction change.

A/D Inputs Tab

The "A/D Inputs" tab displays the current state of the analog-to-digital channels for Sealevel I/O devices that feature A/D inputs. Settings are provided for both device wide and per-channel configuration.



The "Device Configuration" selection drop-box adjusts the arrangement and function of the A/D input channels. Input channels are displayed as banks (groups of eight). Each channel is range configurable via the voltage range dropdown list. Both the channel voltage range and device-wide configuration are set on a dropdown list. There is no need to save your settings – they are automatically saved to the device as you select the various configuration options.

"10x Hardware Gain Enabled" checkbox – Indicates whether or not the onboard hardware gain jumper is currently set. This option is **not** user configurable – it only reflects the status of the onboard hardware jumper settings. Set the hardware jumper to enable this functionality, which allows smaller voltages to be measured more accurately (e.g., a 0-1V input signal can be measured more accurately by enabling the 10x hardware gain jumper and setting the SeaI/O-470 A/D input channel for 0-10V range).

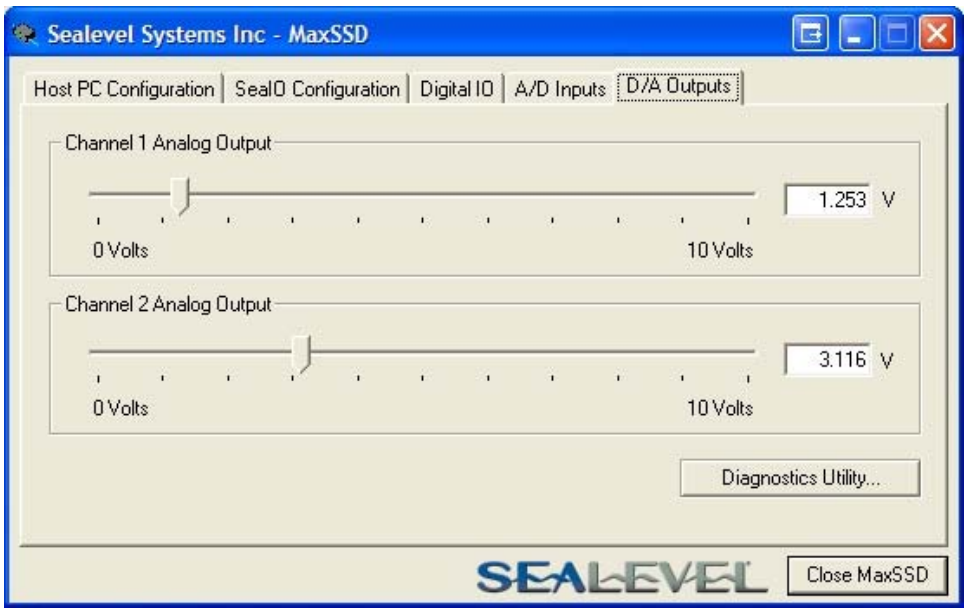
"Show 12-Bit Hex Values" checkbox – Displays the values returned by the A/D converter as a hexadecimal value without converting the values to engineering units (i.e., Amps or Volts)

D/A Outputs Tab

The "D/A Outputs" tab is useful for manually setting the digital to analog output voltages on applicable Sealevel I/O devices with D/A channels. A preliminary diagnostics utility (see following page) has been provided to verify proper hardware functionality.

The D/A outputs of the SeaI/O-470 and SeaDAC 8227 are factory set for 0-10V. To configure the D/A outputs for 0-5V, you will need to open the enclosure and set the correct jumpers. Refer to the **Hardware Configuration** section of this manual for instructions on opening the enclosure and accessing the correct jumpers.

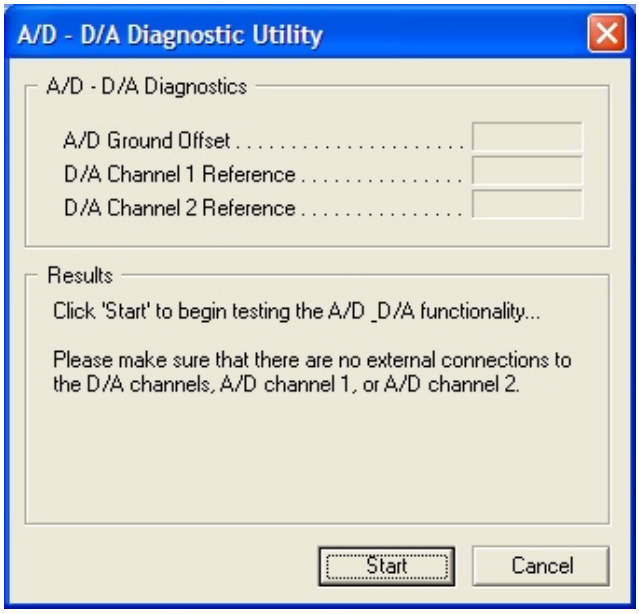
To adjust a particular channel's output voltage, drag the slider until the desired voltage is displayed in the window on the right side. Also, you may type the desired voltage directly into the voltage display and then confirm your entry by pressing the 'Enter' key on your keyboard.



NOTE: The output voltage will not change until the 'Enter' key is pressed or you have clicked on the window anywhere outside of the text entry field.

A/D & D/A Diagnostics

To check basic functionality of both the A/D and D/A converters, press the "Diagnostics Utility" button on the "D/A Outputs" tab (shown on the previous page) and then press the "Start" button, as shown below. Any errors will be shown in the "Results" pane. If any errors occur, please contact technical support for further help.


A/D - D/A Diagnostic Utility
A/D - D/A Diagnostics
A/D Ground Offset . . . . . .
D/A Channel 1 Reference . . . . . .
D/A Channel 2 Reference . . . . . .
Results
Click 'Start' to begin testing the A/D _D/A functionality...
Please make sure that there are no external connections to the D/A channels, A/D channel 1, or A/D channel 2.
Start
Cancel

Converting A/D & D/A Values

To properly use the values returned from the SeaI/O-470 and SeaDAC 8227 module's A/D channels, the application program must convert the returned values to engineering units (voltage). Likewise, the application program must output the correct value to the I/O module's D/A outputs to generate the desired voltage.

The conversion formulas will vary depending on how the I/O module is configured. The formulas and their uses are covered in detail in the interactive documentation located on the Sealevel website at:

http://www.sealevel.com/software/SeaMAX/

Troubleshooting SeaMAX

Following these simple steps can eliminate most common problems.

1. Read this manual thoroughly before attempting to install the device in your system.
2. Uninstall any previous versions of the SeaMAX software before installing any new versions.
3. **Install SeaMAX software first, before connecting any Sealevel I/O devices**. Installing the software places the necessary files in the proper locations on your system. After installing the software, proceed with adding the hardware.
4. When installing SeaI/O modules, connect them one at a time. The "base" module must be properly configured and communicating successfully with the host before you can add additional expansion modules. Verify each expansion module can communicate before connecting additional expansion modules.
5. Confirm that all screw terminal connections are correct and secure and that the correct cables are being used, including network cables (crossover vs. patch cables).
6. You can use standard network patch cables (straight-through cables) to connect SeaI/O modules together via the pass-through connectors on the left side of the module. Crossover cables should never be used to connect two or more SeaI/O modules together. Crossover cables should **only** be used to connect an Ethernet SeaI/O module to a host without going through an Ethernet hub or switch.
7. On SeaI/O modules, verify that the device address (slave ID) is properly set. Refer to the **Hardware Configuration** section of this manual for instructions on setting the device slave ID.
8. Use the MaxSSD utility, included on the software CD, to verify proper installation. MaxSSD is designed to simplify the installation, configuration, and diagnostics of Sealevel SeaI/O modules.
9. If the SeaI/O modules only sometimes respond to a **Get** operation or return invalid data, you may have termination improperly set. Refer to the **Hardware Configuration** section of this manual for instructions on properly setting line termination and pull-up/pull-down resistors.
10. Refer to the **Troubleshooting Ethernet Modules** section on the following page for additional steps regarding Ethernet (E-series) SeaI/O modules.
11. If these steps do not solve your problem, please contact Sealevel Technical Support. Our technical support is free and available from 8:00AM-5PM Eastern Time, Monday through Friday. You can contact Technical Support via:

    Phone: (864) 843-4343

    Email: support@sealevel.com

Troubleshooting Ethernet (E-series) SeaI/O Modules

Problem: The SeaI/O module starts up with a strange IP address (i.e., 169.254.x.x)

All Ethernet SeaI/O (E-series) modules are shipped with DHCP enabled. If no DHCP server is available or the DHCP server cannot be reached, the Ethernet SeaI/O module will default to a random IP address in the range 169.254.0.1 to 169.254.255.254. Change the PC's network settings to place both the SeaI/O module and PC on the same subnet. Adjust the SeaI/O module's IP address and Netmask using the **Ethernet Config** utility (Start → All Programs → Sealevel SeaMAX → Ethernet Config) installed with SeaMAX. Then restore the PC's network settings.

Problem: The SeaI/O module is visible in Ethernet Config, but the network settings cannot be changed

The SeaI/O module is most likely on a different subnet than the PC. The PC's IP address and Netmask must be altered to place both the SeaI/O module and the PC within the same subnet. Contact your network administrator for assistance.

Problem: The SeaI/O module doesn't show up in Ethernet Config

The Ethernet SeaI/O modules are discovered via a UDP broadcast. Verify that any firewall software, such as Windows Firewall, ZoneAlarm, etc., or router settings that would hinder UDP transmissions are disabled.

It is also possible that the SeaI/O module may not be discovered if the PC and module are on separate subnets. This may occur if the module's IP address is configured outside the range of the PC's subnet. It can also occur during a failed DHCP discovery. In either case, the "Recover Module" button in Ethernet Config utility may be used to recover the device. Refer to the **Hardware Configuration** section of this manual for more information.

Problem: The rotary switch (ADDR) was used to reset an Ethernet SeaI/O module, but it no longer responds to a 'Get' operation.

If you reset the SeaI/O module by rotating the rotary switch clockwise one full revolution, the RS-485 port will reset to 9600 bps and no parity, but the Ethernet port will remain unaffected.

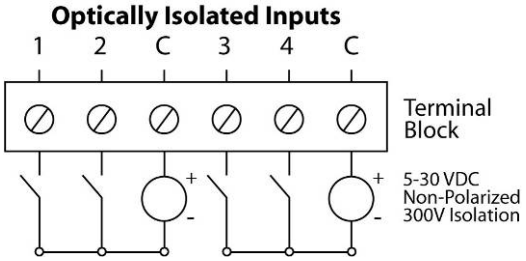
The broadcast feature in MaxSSD sets the Ethernet SeaI/O (E-series) module's TCP/IP to RS-485 translation data rate independently of the SeaI/O module itself. Therefore, if you have an Ethernet SeaI/O module and you set the data rate to 115.2K bps via a MaxSSD broadcast command, both the RS-485 port and the Ethernet port will respond thereafter to 115.2K bps, as expected. Using the rotary switch will reset the RS-485 port, but the Ethernet port will still try to communicate at 115.2k bps. To restore communications, broadcast a set data rate and parity command (9600 and no parity) via MaxSSD.

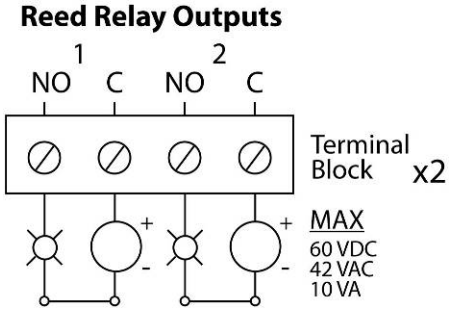
Wiring Options

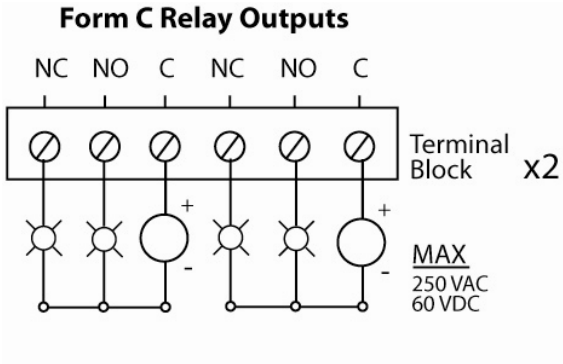
I/O Wiring – SeaDAC Lite 8111 – 8115 Modules

Depending on model, you can control and monitor up to 4 optically isolated inputs and 4 Reed or Form C relay outputs. Each Reed or Form C relay has a discrete common (ground) and each pair of inputs share a common. Reed relays can switch up to 60VDC @ 500mA, while Form C relays can switch up to 60VDC @ 5A or 250VAC @ 6A. The non-polarized input voltage range is 5-30VDC and features 300V optical isolation to protect the host computer from damaging voltage transients and ground loops commonly found in industrial environments.

Field wiring is simplified via 3.5mm removable screw terminal blocks with optional spring clamp terminal blocks also available. The removable terminal blocks are compatible with 14-22 AWG field wiring.







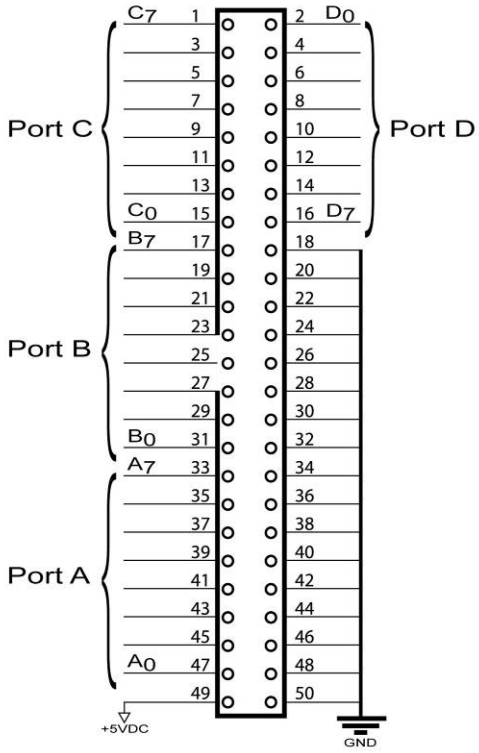
I/O Wiring – SeaDAC Lite 8126 TTL Module

The 8126 addresses the 32 channels of buffered drive digital I/O as four eight-bit ports, each programmable as input or output. The I/O channels are accessed via an industry standard 50-pin header connector. Use a standard 50-pin IDC ribbon cable to connect an industry standard relay rack, terminal block (Item# TB07), or relay rack simulation module (Item# TA01). Each channel can sink up to 64mA or source up to 32mA. All channels combined cannot exceed a total output of 350mA.

NOTE: Relay racks with less than 32 channels expect all even pins to be commons. When using relay racks with less than 32 channels, set Port D as an input to avoid shorting the outputs to ground through the relay rack.

8126 – 50-Pin Header Connector

The 8126 has the following pin out which is compatible with a wide variety of industry standard solid-state relay racks.



NOTE: The 8126 modules are designed to work with industry standard solid-state relay racks that expect negative logic to operate. The 8126 modules expect positive logic on the inputs.

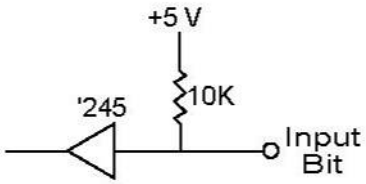
8126 TTL Logic & Example Circuits

The 8126 uses 74ABT245 octal bidirectional transceivers to provide TTL input/output capabilities. Each bit is pulled to +5V through a 10K Ω pull-up resistor to insure each bit is at a known state when not driven.

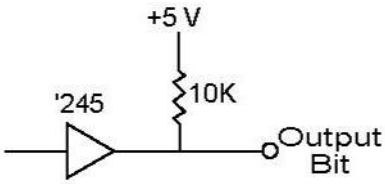
The inputs use positive logic and are active true. If an input is driven high (2V to 5.25V) it will read as a logical one (1), and if driven low (0V to 0.8V) it will read as a logical zero (0). If an input is not driven, it will read as a one (1) due to the 10K Ω pull-up resistors on each port.

The outputs use negative logic. Writing a zero (0) to an output corresponds to 5V, while writing a one (1) to an output corresponds to 0V.

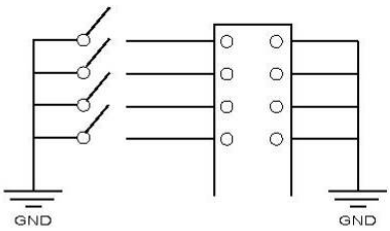
Input Circuit Schematic



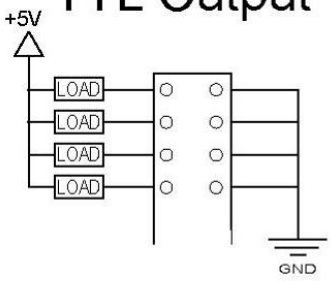
Output Circuit Schematic



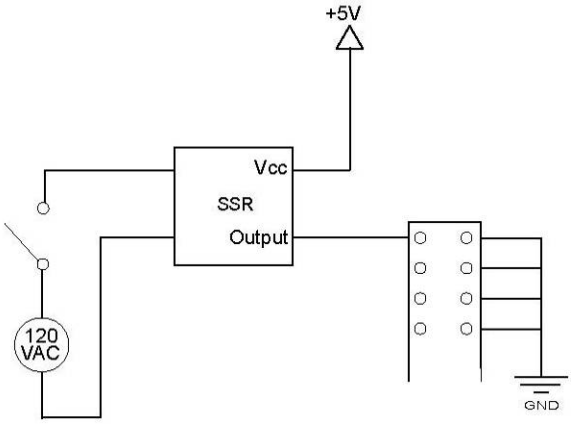
TTL Input



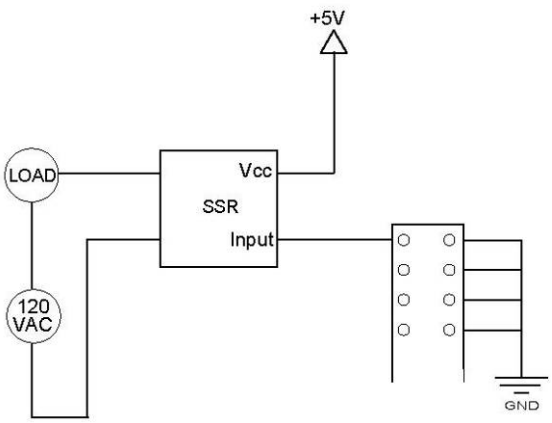
TTL Output



Solid State Relay Input



Solid State Relay Output



Technical Specifications

Dimensions

SeaDAC Lite Modules

L	W	H
4.3”	3.4”	1.3”
109mm	86mm	32mm

iPorthole Modules

L	W	H
3.2”	3.1”	0.8”
81mm	79mm	21mm

OEM Modules

L	W	H
2.9”	2.5”	0.8”
74mm	64mm	21mm

Environmental Specifications

Specification	Operating	Storage
Temperature Range	0°C – 70°C (32°F – 158°F)	-50°C – 105°C (-58°F – 221°F)
Humidity Range	10 to 90% R.H. Non-Condensing	10 to 90% R.H. Non-Condensing

Manufacturing

All Sealevel Systems Printed Circuit boards are built to UL 94V0 rating and are 100% electrically tested. These printed circuit boards are solder mask over bare copper or solder mask over tin nickel.

Appendix A – How To Get Assistance

When calling for technical assistance, please have your user manual and current device settings ready. If possible, please have the device installed and ready to run diagnostics.

Sealevel Systems maintains a website on the Internet. Our homepage address is http://www.sealevel.com. The latest software updates and newest manuals are available via our FTP site that can be accessed from our home page. Manuals and software can also be downloaded from the product page for your device.

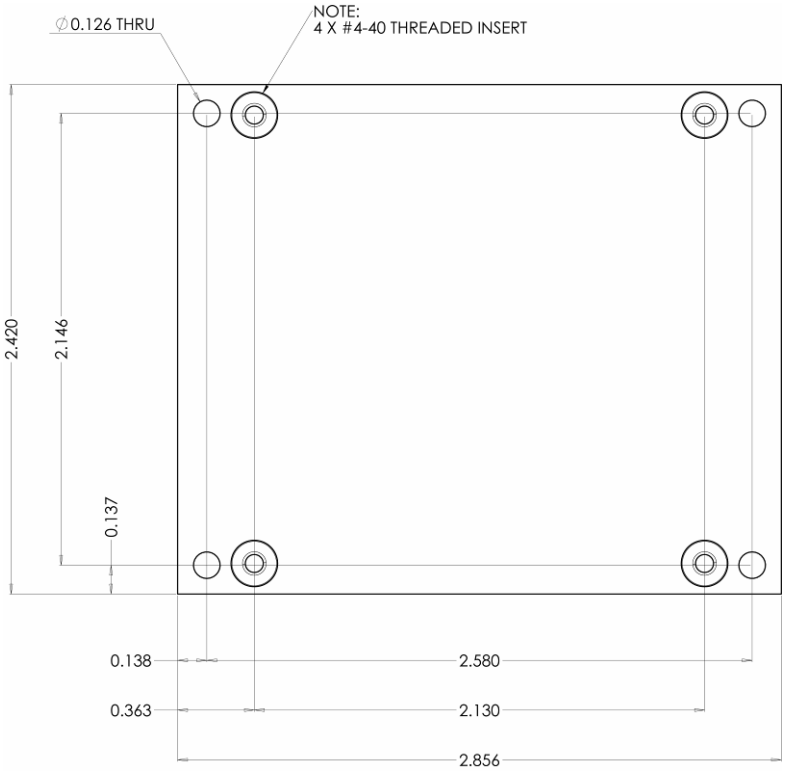
Sealevel Systems provides an FAQ section on our website. Please refer to this to answer many common questions. This section can be found at http://www.sealevel.com/faq.asp

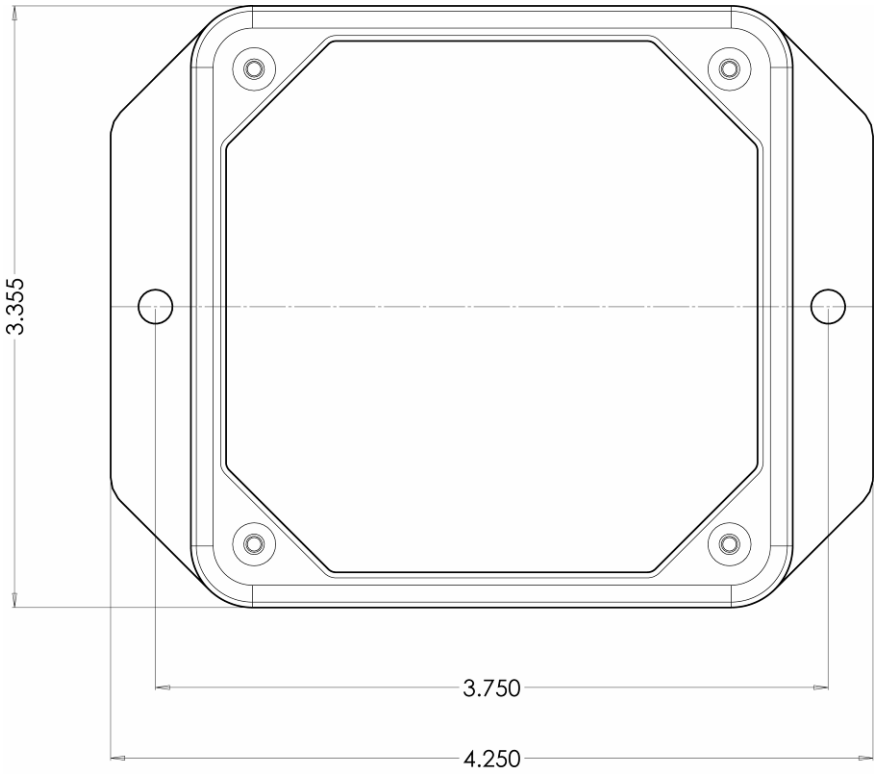
Technical support is available Monday to Friday from 8:00 a.m. to 5:00 p.m. eastern time (UTC-6 hours). You can contact Technical Support via:

Phone: (864) 843-4343

Email: support@sealevel.com

Appendix B – CAD Drawings





Appendix C – Compliance Notices

Federal Communications Commission Statement

FCC - This equipment has been tested and found to comply with the limits for Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in such case the user will be required to correct the interference at the user's expense.

EMC Directive Statement

Products bearing the CE Label fulfill the requirements of the EMC directive (89/336/EEC) and of the low-voltage directive (73/23/EEC) issued by the European Commission.

To obey these directives, the following European standards must be met:

EN55022 Class A - "Limits and methods of measurement of radio interference characteristics of information technology equipment"

EN55024 – "Information technology equipment Immunity characteristics Limits and methods of measurement".

EN60950 (IEC950) - "Safety of information technology equipment, including electrical business equipment"

Warning
This is a Class A Product. In a domestic environment, this product may cause radio interference in which case the user may be required to take adequate measures to prevent or correct the interference.

Always use cabling provided with this product if possible. If no cable is provided or if an alternate cable is required, use high quality shielded cabling to maintain compliance with FCC/EMC directives.

Warranty

Sealevel's commitment to providing the best I/O solutions is reflected in the Lifetime Warranty that is standard on all Sealevel manufactured products. We are able to offer this warranty due to our control of manufacturing quality and the historically high reliability of our products in the field. Sealevel products are designed and manufactured at its Liberty, South Carolina facility, allowing direct control over product development, production, burn-in and testing.

Sealevel Systems, Inc. (hereafter "Sealevel") warrants that the Product shall conform to and perform in accordance with published technical specifications and shall be free of defects in materials and workmanship for life. In the event of failure, Sealevel will repair or replace the product at Sealevel's sole discretion. Failures resulting from misapplication or misuse of the Product, failure to adhere to any specifications or instructions, or failure resulting from neglect or abuse are not covered under this warranty. Warranty service is obtained by delivering the Product to Sealevel and providing proof of purchase.

NOTE: **Return authorization must be obtained from Sealevel Systems before returned merchandise will be accepted. Authorization is obtained by calling Sealevel Systems and requesting a Return Merchandise Authorization (RMA) number.**

The Customer agrees to insure the Product or assume the risk of loss or damage in transit, to prepay shipping charges to Sealevel, and to use the original shipping container or equivalent. Warranty is valid only for original purchaser and is not transferable.

Sealevel Systems assumes no liability for any damages, lost profits, lost savings or any other incidental or consequential damage resulting from the use, misuse of, or inability to use this product. Sealevel Systems will not be liable for any claim made by any other related party.

This warranty applies to Sealevel manufactured Product. Product purchased through Sealevel but manufactured by a third party will retain the original manufacturer's warranty.

Sealevel Systems, Incorporated
2779 Greenville Highway
P.O. Box 830
Liberty, SC 29657 USA
(864) 843-4343 FAX: (864) 843-3067
www.sealevel.com
email: support@sealevel.com

Technical Support is available Monday - Friday from 8 a.m. to 5 p.m. Eastern time.

Trademarks

Sealevel Systems, Incorporated acknowledges that all trademarks referenced in this manual are the service mark, trademark, or registered trademark of the respective company.